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## REPORT DOCUMENTATION PAGE

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1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED	
		Final 15 Jul 97 to 14 Mar 98	
4. TITLE AND SUBTITLE		5. FUNDING NUMBERS	
Simox Evaluation Program		62228D 4276/AS	
6. AUTHOR(S)		7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)	
Dr Bhar		University of District of Columbia Room 515 (MB 4810) Bldg 48 4200 Connectivut Avenue NW Washington dc 20008	
8. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		9. PERFORMING ORGANIZATION REPORT NUMBER	
AFOSR/NE 110 Duncan Aven RmB115 Bolling AFB DC 20332-8050			
10. SPONSORING/MONITORING AGENCY REPORT NUMBER			
11. SUPPLEMENTARY NOTES			
12a. DISTRIBUTION/AVAILABILITY STATEMENT		12b. DISTRIBUTION CODE	
APPROVAL FOR PUBLIC RELEASED: DISTRIBUTION UNLIMITED			
13. ABSTRACT (Maximum 200 words)			
<p>The equipment bought under this project is used to study the reliability of devices fabricated on SIMOX substrates. SIMOX (separation-by-implantation-of-oxygen)material is used primarily for low power IC application. The reliability of devices fabricated on SIMOX substrates is influenced by oxide degradation due to charge trapping, interface state generation, and bulk trap generation in SIMOX.</p>			
14. SUBJECT TERMS		15. NUMBER OF PAGES	
16. PRICE CODE		17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED	
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20. LIMITATION OF ABSTRACT UL		NSN 7540-01-280-5500	

**FINAL TECHNICAL REPORT  
ON  
SIMOX EVALUATION PROGRAM  
(Grant #F49620-97-0516)**

Submitted to  
**AIR FORCE OFFICE OF SCIENTIFIC RESEARCH /NE**  
**110 Duncan Avenue Room B115**  
**Bolling AFB DC 20332-8050**

BY  
**Dr. Tarak Bhar**  
**Dept. of Arch. Engr. and Tech.**  
**University of the District of Columbia**  
**4200 Connecticut Avenue NW**  
**Washington DC 20008**

**FINAL TECHNICAL REPORT ON  
SIMOX EVALUATION PROGRAM**

Period Covered: 15 July 1997- 14 March 1998 (including two months extension)

A. The "SIMOX (separation-by-implantation-of-oxygen) Evaluation Program" funded by AFOSR/NE is intended for acquisition of scientific equipment to do research on the evaluation of SIMOX material by avalanche injection technique. Due to unavoidable circumstances in the DC government approval process (Exhibit 1), the specified period of the project was extended for an additional two months ending on 14 March 1998

B. The following is a list of equipment acquired under the project:

1. Keithly Instruments Inc. (Exhibit 2)  
C/O Technical Representatives  
PO Box 5176  
Cleveland, OH 44190

Date of Order: 02/17/98

Equipment bought:	Cost:
1 Model 82 Win C-V System	\$28,722.99
1 Model 237 SMU	5,756.40
1 Test Point Software Package	895.50
1 Model 7001 80 Channel Switch System	1,705.50
1 Model 7153 4X5 H/V Low Current Matrix Card	2,308.50
2 Model 7153 TR X Low Noise Cable	1,215.00
4 237-BNC-TRX3 Lug Female Triax to Male BNC Adapter	<u>342.00</u>
Subtotal:	\$40,945.89

2. Manufacturer: Hewlett Packard Company (Exhibit 3)

2101 Gaither Road  
Rockville, MD 20850

Date of Order: 02/14/98

Equipment bought:	Cost:
1 Model 3245A Function Generator	\$4,545.00
1 Option 002 10 X High Voltage Amplifier	<u>1,431.00</u>
Subtotal:	\$5,976.00

2. Manufacturer: COMP USA (Exhibit 4)

8357 Leesburg Pike  
Vienna, VA 22182

Date of Purchase: 03/13/98

Equipment bought:	Cost:
1 HP 8275 PII 300 48/8 Computer	\$1,924.97
1 HP 17.28 M70 MM Monitor	624.97
1 HP Deskjet 722C	274.97
1 CUSA CBL Gold IEEE #128V	34.99
1 PNY 32 MB SDRAM	<u>129.99</u>
Subtotal:	\$2,989.89
<b>Total:</b>	<b>\$49,911.78</b>

C. The following is a list of changes to the equipment listed in the proposal:

Model 5958 Software	is replaced by	237 High Voltage SMU
Model 6157 Electrometer		Test Point Software Package
Model 7058 Switch Card		7153 Matrix Card
(All from Keithly Insts)		7153 Low Noise Cable
	237 Female to Male Adapter	
	(All from Keithley Insts)	

D. The equipment bought under this project is used to study the reliability of devices fabricated on SIMOX substrates. SIMOX (separation-by-implantation-of-oxygen) material is used primarily for low power IC application. The reliability of devices fabricated on SIMOX substrates is influenced by oxide degradation due to charge trapping, interface state generation, and bulk trap generation in SIMOX BOX. Also, the SIMOX BOX must be radiation hardened for defense and space applications. It is therefore necessary to precisely determine and control the densities and cross-sections of electron and hole traps in the BOX. Avalanche injection of charge is used to fill traps. High frequency capacitance-voltage (C-V) curves is used to measure and characterize the trapped charge.

EXHIBIT 1.

University of the District of Columbia

Office of Grant Administration, MB 4810  
4200 Connecticut Avenue, N.W.  
Building 48 Room 515, Washington, D.C. 20008.  
Telephone (202) 274-5597 Fax (202) 274-5264



December 3, 1997

Ms. Jennifer L. Bell  
Post Award Specialist  
U.S. Air Force Office of Scientific Research  
110 Duncan Avenue (Room B115)  
Bolling Air Force Base  
Washington, D.C. 20332-8050  
(Re:F49620-97-0516)

Dear Ms. Bell:

We refer to the currently awarded AFOSR grant, reference number F49620-97-0516, entitled, "Simox Evaluation Program". The University has experienced innumerable delays in getting the grant's spending authority established, relative to FY-1998, in the D.C. Government's Management System. These delays have materially affected our ability to successfully order and subsequently pay for the equipment specified in the grant. Therefore, a change in the grant's ending date, until March 14, 1998, is hereby requested.

Please feel free to contact me (on 202-274-5263) or Dr. Bhar, the project director (on 274-5836) concerning this matter.

Yours truly,

Mr. L.H. Barnes  
Director, Grant Administration

Dr. Tarak Bhar  
Project Director

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GOVERNMENT  
OF THE  
DISTRICT OF COLUMBIA

## EXHIBIT 2.

FAXED  
2/17/98

## PURCHASE ORDER

MO DY YR DATE OF ORDER	PURCHASE ORDER ID		TERMS		ORDER PLACED IN ACCORDANCE WITH ALL PROVISIONS OF UDC PROC. REG.	
	TRAN CODE PC	TRAN NUMBER ORD00018419			CONTRACT NO.	QUOT.
TO VENDOR	TYPE VENDOR CODE				INVITATION NO.	DATED
	CA	00419041900				
NAME: KEITHLEY INSTRUMENTS, INC. ADDRESS: C/O TECHNICAL REPRESENTATIVES PO BOX 5176 CLEVELAND OH 44190				ALL CHARGES PREPAID TO: UNIVERSITY OF DC 4200 CONNECTICUT AVE N.W. WASHINGTON DC 20008 RECEIVING BLDG 38 C-LEVEL		

LINE NO.	FUND	AREA	ORG	SUB ORG	FUNCTION	OBJ	SUB OBJ	JOB NUMBER	RPTG CATEGORY	AMOUNT
01	413	04	F050		U300	702				40,603.89
02	413	04	F050		U300	702				342.00

LINE NO.	ITEM NO.	QUANTITY	UNIT	UNIT COST	EXTENDED COST
001	MODEL 82WIN C-V SYSTEM	1.00	EA	28,722.990	28,722.99
002	MODEL & DESCRIPTION				
	MODEL 82-WIN CONSISTING OF 595 QUASISTAT C-V METER 590/100K IM C-V ANALYZER 230-1 PROGRAMMABLE VOLTAGE SOURCE, 5909 CALIBRATION SOURCE 5951 REMOTE INPUT COUPLER, 5957 SIMULTANEOUS C-V SOFTWARE FOR DOS COMPUTERS AND METRICS-ICS INTERACTIVE CHARACTERIZATION SOFTWARE WITH CV DRIVERS FOR WINDOWS, USER ASSEMBLED AND CONFIGURED.				
002	MODEL 237 SMU 237 H/V SOURCE MEASURE UNIT DEMO	1.00	EA	5,756.400	5,756.40
003	TEST POINT SOFTWARE PACKAGE	1.00	EA	895.500	895.50
004	MODEL 7001 80 CHANNEL SWITCH SYSTEM MAINFRAME	1.00	EA	1,705.500	1,705.50
005	MODEL 7153 4X5 H/V LOW CURRENT MATRIX CARD	1.00	EA	2,308.500	2,308.50
006	MODEL 7153 TRX LOW NOISE M-SERIES TO 3-SLOT TRIAX CABLE	2.00	EA	607.500	1,215.00
007	237-BNC-TRX 3 LUG FEMALE TRIAX TO MALE BNC ADAPTER	4.00	EA	85.500	342.00
	MARKED FOR: SIMOX BLDG. 42 RM. 109 ATTN: T. BHAR				
	SH PR#30333				

*Open*  
*Date 7/17/98*

SEND INVOICES WITH IDENTIFYING PURCHASE ORDER NUMBER TO:	AGENCY CERTIFICATION	TOTAL EXTENDED COST
University of D.C.-Van Ness Campus Accounting Office-Bldg 43/Room 53A 4200 Connecticut Avenue, N.W. Washington, D.C. 20008	I certify that the items herein have been charged to the correct accounting codes listed above. These amounts are also included in the individual item totals.	40,945.89
<i>D. J. Miller</i>		DATE 2/17/98
CERTIFICATE OF ACCEPTANCE FROM RMS		CHECK IF THIS DOCUMENT IS CONTINUOUS <input type="checkbox"/>
I certify that the document was accepted by RMS.		PAGE
DATE ACCEPTED 2/17/98		01
BY <i>D. J. Miller</i>		OF

VENDOR COPY

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OF THE  
DISTRICT OF COLUMBIA

EXHIBIT 3.

PURCHASE ORDER

MO DY YR DATE OF ORDER	PURCHASE ORDER ID		TERMS			ORDER PLACED IN ACCORDANCE WITH ALL PROVISIONS OF UDC PROC. REG.	
	TRAN CODE	TRAN NUMBER				CONTRACT NO.	QUOT.
02 24 98	PC	ORD00018455	INVITATION NO.	DATED			
T O V E N D O R S	TYPE		VENDOR CODE			D E L I V E R T O	ALL CHARGES PREPAID TO: UNIVERSITY OF DC 4200 CONNECTICUT AVE N.W. WASHINGTON DC 20008 RECEIVING BLDG 38 C-LEVEL
	[CA]	05518973200					
NAME: HEWLETT PACKARD COMPANY ADDRESS: 2101 GAITHER ROAD ROCKVILLE		MD 20850					

LINE NO.	FUND	AREA	ORG	SUB ORG	FUNC-TION	OBJ	SUB OBJ	JOB NUMBER	RPTG CATEGORY	AMOUNT
01	413	04	F050		U300	702				5,976.00

LINE NO.	ITEM NO.	QUANTITY	UNIT	UNIT COST	EXTENDED COST
001	1.00 EA @	4,545.000	4,545.00		
MODEL#3245A FUNCTION GENERATOR (PUR AGREEMENT #G7M92)					
002 SEE ATTACH	1.00 EA @	1,431.000	1,431.00		
OPTION 002 - 10X HIGH VOLTAGE AMPLIFIER					

MARKED FOR: DR. TARAK BHAR, BLDG. 42/109

*Carylyn E. McIlwain*      *3/5/98*

AUTHORIZED PROCUREMENT SIGNATURE  
PR#30460  
AJ

*GRANT*

**FAXED**  
*3/6/98*

SEND INVOICES WITH IDENTIFYING PURCHASE ORDER NUMBER TO:	AGENCY CERTIFICATION I certify that the items herein have been charged to the correct accounting codes listed above. These accounting codes are under the jurisdiction of this agency.	TOTAL EXTENDED COST 5,976.00
University of D.C.-Van Ness Campus Accounting Office-Bldg 48/Room 538 4200 Connecticut Avenue, N.W. Washington, D.C. 20008	<i>Hallett Blane</i> DATE: <i>3/6/98</i>	CHECK IF THIS DOCUMENT IS CONTINUED: <input type="checkbox"/>
	CERTIFICATE OF ACCEPTANCE INTO FMS I certify that this document was accepted into FMS.	PAGE 01 OF <i>/</i>
	DATE ACCEPTED: <i>03/12/98</i>	
	BY: <i>Carylyn E. McIlwain</i>	

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OF THE  
DISTRICT OF COLUMBIA

EXHIBIT 4  
PURCHASE ORDER

(703)749-4411

MO D Y YR DATE OF ORDER	PURCHASE ORDER ID			TERMS			ORDER PLACED IN ACCORDANCE WITH ALL PROVISIONS OF UDC PROC. REG.	
	TRAN CODE PC	TRAN NUMBER ORD00018595					QUOT.	
TO VENDOR	TYPE CA	VENDOR CODE 12142809846			D E L I V E R T O	ALL CHARGES PREPAID TO: UNIVERSITY OF DC 4200 CONNECTICUT AVE N.W. WASHINGTON DC 20008 RECEIVING BLDG 38 C-LEVEL		
		NAME: COMPUSA ADDRESS: 8357 LEESBURG PIKE VIENNA VA 22182			T O			

LINE NO.	FUND	AREA	ORG	SUB ORG	FUNCTION	OBJ.	SUB OBJ	JOB NUMBER	RPTG CATEGORY	AMOUNT
01	413	04	F050		U300	702				2,989.89

LINE NO.	ITEM NO.	QUANTITY	UNIT	UNIT COST	EXTENDED COST
001		1.00	EA	1,924.970	1,924.97
#1811551	- HP 8275 PII300 48/8.0 MT(COMPUTER BUNDLE 818075)				
002		1.00	EA	624.970	624.97
#159874	- HP 17.28 M70 MM MONITOR (COMPUTER BUNDLE 818075)				
003		1.00	EA	274.970	274.97
#167014	- HP DESKJET 722C (COMPUTER BUNDLE 818075)				
004		1.00	EA	34.990	34.99
#147979	- CUSA CBL GOLD IEEE #1284 10				
005	SEE ATTACHE	1.00	EA	129.990	129.99
#167276	PNY 32MB SDRAM (818075 COMPUTER BUNDLE)				

QUOTE NO. 93980, DATED 02/21/98

MARKED FOR: SIMOX, BLDG.. 42/109, TARAK BHAR

*Carlin E. McElroy 3/18/98*  
AUTHORIZED PROCUREMENT SIGNATURE  
PR#30824 AJ

**FAXED**  
03/18/98

SEND INVOICES WITH IDENTIFYING PURCHASE ORDER NUMBER TO:	AGENCY CERTIFICATION I certify that the items herein have been charged to the correct accounting codes listed above. These accounting codes are under the jurisdiction of this agency.	TOTAL EXTENDED COST 2,989.89
University of D.C.-Van Ness Campus Accounting Office-Bldg 48/Room 538 4200 Connecticut Avenue, N.W. Washington, D.C. 20008	BY: <i>A. B. J.</i> DATE: _____	CHECK IF THIS DOCUMENT IS CONTINUED: <input type="checkbox"/>
	CERTIFICATE OF ACCEPTANCE INTO FMS I certify that this document was accepted into FMS.	
	DATE ACCEPTED: <i>03/18/98</i>	PAGE <b>01</b> OF _____
	BY: <i>A. B. J.</i>	

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